General

Guideline Title

Maternal collapse in pregnancy and the puerperium.

Bibliographic Source(s)

Royal College of Obstetricians and Gynaecologists (RCOG). Maternal collapse in pregnancy and the puerperium. London (UK): Royal College of Obstetricians and Gynaecologists (RCOG); 2011 Jan. 24 p. (Green-top guideline; no. 56). [98 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

In addition to these evidence-based recommendations, the guideline development group also identifies points of best clinical practice in the original guideline document.

Classification of evidence levels (1++ to 4) and grades of recommendations (A–D) are defined at the end of the "Major Recommendations" field.

Clinical Issues

Can Women at Risk of Impending Collapse Be Identified Early?

D - An obstetric early warning score chart should be used routinely for all women, to allow early recognition of the woman who is becoming critically ill.

In some cases maternal collapse occurs with no prior warning, although there may be existing risk factors that make this more likely. Antenatal care for women with significant medical conditions at risk of maternal collapse should include multidisciplinary team input with a pregnancy and delivery management plan in place. Often there are clinical signs that precede collapse. In the latest Confidential Enquiry into Maternal and Child Health (CEMACH) report, substandard care was often identified where these signs and symptoms were not recognised and acted upon. The report recommended that a national obstetric early warning scoring system should be introduced and used for all obstetric women, including those being cared for outside the obstetric setting. [Evidence Level 4]

What Are the Causes of Maternal Collapse?

See the original guideline document for a discussion of the common causes of maternal collapse, including haemorrhage, thromboembolism, amniotic fluid embolism, cardiac disease, sepsis, drug toxicity/overdose, eclampsia, intracranial haemorrhage, anaphylaxis, and other causes.

What Is the Optimal Initial Management of Maternal Collapse?

Tilt

C - From 20 weeks of gestation onwards, the pressure of the gravid uterus must be relieved from the inferior vena cava and aorta.

C - A left lateral tilt of 15° on a firm surface will relieve aortocaval compression in the majority of pregnant women and still allow effective chest compressions to be performed.

A left lateral tilt of 15° can be achieved on an operating table using a Cardiff wedge by having someone kneel on the right side of the woman with their knees under the woman's thorax, although this has the disadvantage of the tilt being removed for defibrillation; alternatives are using an upturned chairback or using manual displacement of the uterus to the left. [Evidence level 2+]

In cases of major trauma, the wedge should be placed under the spinal board. In the absence of a spinal board, manual displacement of the uterus should be used. Using soft surfaces such as a bed or objects such as pillows or blankets is not nearly as effective and compromises effective chest compressions, but is better than leaving the woman supine.

Circulation

B - In the absence of breathing despite a clear airway, chest compressions should be commenced immediately.

Chest compressions should not be delayed by palpating for a pulse, but should be commenced immediately in the absence of breathing and continued until the cardiac rhythm can be checked and cardiac output confirmed. Compressions may be made difficult because of obesity and the tilted position. Hand position should be over the centre of the chest, and it is important to ensure that the direction of compression is perpendicular to the chest wall, thus the angle of tilt must be taken into account. Compressions should be performed at a ratio of 30:2 ventilations unless the woman is intubated, in which case chest compressions and ventilations should be desynchronised, with compressions being performed at a rate of 100/minute and ventilations at a rate of 10/minute. Because chest compressions are not as effective after 20 weeks of gestation, there should be early recourse to delivery of the fetus and placenta if cardiopulmonary resuscitation (CPR) is not effective. [Evidence level 2++]

C - Abdominal ultrasound by a skilled operator can assist in the diagnosis of concealed haemorrhage.

Very occasionally, ultrasound by a skilled operator can aid diagnosis in cases of massive abruption and intra-abdominal bleeding, although laparotomy should not be delayed if the findings are negative or the index of suspicion is high. However, this should not interfere with the resuscitation process. [Evidence level 2+]

B - The same defibrillation energy levels should be used as in the nonpregnant patient.

If defibrillation is required, the same settings should be used as in the nonpregnant patient as there is no change in thoracic impedance. Adhesive defibrillator pads are preferable to defibrillator paddles, and the left defibrillation pad should be applied lateral to the left breast. The energy from the defibrillation shock is directed across the heart and there is no evidence that shocks from a direct current defibrillator have an adverse effect on the fetus. Uterine monitors should be removed before shock delivery. [Evidence level 2++]

Drugs

D - Common, reversible causes of maternal cardiopulmonary arrest should be considered throughout the resuscitation process.

When, Where and How Should Perimortem Caesarean Section Be Performed?

D - If there is no response to correctly performed CPR within 4 minutes of maternal collapse or if resuscitation is continued beyond this in women beyond 20 weeks of gestation, delivery should be undertaken to assist maternal resuscitation. This should be achieved within 5 minutes of the collapse.

What Does the Continuing Management Consist of?

Sepsis

A - Septic shock should be managed in accordance with the Surviving Sepsis Campaign guidelines.

The Surviving Sepsis Campaign has updated the management of sepsis and septic shock. The speed and appropriateness of therapy administered in the initial hours after severe sepsis develops are likely to influence outcome, with early resuscitation improving survival rates. A multidisciplinary team approach is required including midwives, consultant obstetricians, consultant anaesthetists, consultant haematologists, consultant intensivists and consultant microbiologists. The following 'care bundle' should be applied immediately or within 6 hours, and has been shown to significantly

improve survival rates:

1. Measure serum lactate.
2. Obtain blood cultures/culture swabs prior to antibiotic administration.
3. Administer broad-spectrum antibiotic(s) within the first hour of recognition of severe sepsis and septic shock according to local protocol
4. In the event of hypotension and/or lactate >4 mmol/l:
    a. Deliver an initial minimum of 20 ml/kg of crystalloid/colloid
    b. Once adequate volume replacement has been achieved, a vasopressor (norepinephrine, epinephrine) and/or an inotrope (e.g., dobutamine) may be used to maintain mean arterial pressure over 65 mm Hg.

Further management consists of:

5. In the event of hypotension despite fluid resuscitation (septic shock) and/or lactate over 4 mmol/l:
    a. Achieve a central venous pressure of at least 8 mm Hg (or over 12 mm Hg if the woman is mechanically ventilated) with aggressive fluid replacement
    b. Consider steroids.
6. Maintain oxygen saturation with facial oxygen. Consider transfusion if haemoglobin is below 7 g/dl.

Continuing management involves continued supportive therapy, removing the septic focus, administration of blood products if required and thromboprophylaxis. [Evidence level 1+]

Drug Overdose/Toxicity

Many drug overdoses have specific therapy dependent on the drug in question, and appropriate help should be sought in the management of such cases. In obstetric practice, the two main drugs that can give rise to overdose or toxic problems are magnesium sulphate and local anaesthetic agents.

Magnesium Sulphate

The antidote to magnesium toxicity is 10 ml 10% calcium gluconate given by slow intravenous injection.

Local Anaesthetic Agents

C - Lipid rescue should be used in cases of collapse secondary to local anaesthetic toxicity.

Anaphylaxis

A - In cases of anaphylaxis, all potential causative agents should be removed, and the A, B, C, D, E approach followed.

A - The definitive treatment for anaphylaxis is 500 micrograms (0.5 ml) of 1:1000 adrenaline intramuscularly. PLEASE NOTE THIS DOSE IS FOR INTRAMUSCULAR USE ONLY.

Adrenaline treatment can be repeated after 5 minutes if there is no effect. In experienced hands it can be given intravenously as a 50 microgram bolus (0.5 ml of 1:10 000 solution). Adjuvant therapy consists of chlorpheniramine 10 mg and hydrocortisone 200 mg. Both are given intramuscularly or by slow intravenous injection. [Evidence level 1+]

Clinical Governance

Incident Reporting

D - All cases of maternal death should be reported to the Centre for Maternal and Child Enquiries (CMACE).

Training

A - Life support training reduces morbidity and mortality.

C - Small-group interactive practical training is recommended.

Definitions:

Grades of Recommendation

A - At least one meta-analysis, systematic review or randomised controlled trial rated as 1++ and directly applicable to the target population; *or*

A systematic review of randomised controlled trials or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results

B - A body of evidence including studies rated as 2++ directly applicable to the target population and demonstrating overall consistency of results; *or*

Extrapolated evidence from studies rated as 1++ or 1+

C - A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results; *or*

Extrapolated evidence from studies rated as 2++

D - Evidence level 3 or 4; *or*

Extrapolated evidence from studies rated as 2+

Good Practice Point - Recommended best practice based on the clinical experience of the guideline development group

Classification of Evidence Levels

1++ High-quality meta-analyses, systematic review of randomised controlled trials or randomised controlled trials with a very low risk of bias

1+ Well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias

1- Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias

2++ High-quality systematic reviews of case–control or cohort studies or high quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal

2+ Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal

2- Case–control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal

3 Non-analytical studies, e.g., case reports, case series

4 Expert opinion

Clinical Algorithm(s)

The original guideline document contains clinical algorithms for:

- Post-collapse management
- Maternal collapse

Scope

Disease/Condition(s)

Maternal collapse in pregnancy and the puerperium

Note: Defined as an acute event involving the cardiorespiratory systems and/or brain, resulting in a reduced or absent conscious level (and potentially death), at any stage in pregnancy and up to six weeks after delivery

Guideline Category

Evaluation

Management

Risk Assessment

Clinical Specialty

Anesthesiology

Critical Care

Emergency Medicine

Family Practice

Hematology

Internal Medicine

Obstetrics and Gynecology

Intended Users

Advanced Practice Nurses

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To discuss the identification of women at increased risk of maternal collapse and the different causes of maternal collapse
- To delineate the initial and continuing management of maternal collapse
- To review maternal and neonatal outcomes

Target Population

Women at increased risk of maternal collapse

Interventions and Practices Considered

1. Recognition and identification of women at risk of maternal collapse
2. Maternal resuscitation, following the Resuscitation Council (UK) guidelines using the standard A, B, C approach, with some modification
3. Basic life support and rapid transfer arranged in the community setting
4. Left lateral tilt positioning
5. Airway protection by intubation with a cuffed endotracheal tube
6. Supplemental oxygen
7. Bag and mask ventilation, until intubation can be achieved
8. Chest compressions, in the absence of breathing
9. Two wide-bore cannulae
10. Fluid management
11. Abdominal ultrasound

12. Defibrillation
13. Consideration of cause of collapse and continuation of therapeutic drugs
14. Perimortem caesarean section
15. Continuing management including senior staff with appropriate experience and transfer supervised by an adequately skilled team with appropriate equipment
16. Prompt delivery of fetus and placenta, in the case of haemorrhage
17. Caesarean section, in some cases of massive placental abruption
18. Supportive management for amniotic fluid embolism, including early involvement of senior experienced staff
19. Early, aggressive treatment, including aggressive use of fresh frozen plasma for coagulopathy
20. Management by an expert cardiology team in cardiac cases
21. Management of septic shock according to the Surviving Sepsis Campaign guidelines
22. Management of drug overdose or toxicity
23. Management of eclampsia
24. Management of intracranial haemorrhage with the involvement of appropriate experts
25. Management of anaphylaxis including removal of all potential causative agents, following the A, B, C, D, E approach; basic life support and transfer to a hospital setting; and adrenaline
26. Inclusion of the following team members: general arrest team, senior midwife, and obstetrician and obstetric anaesthetist
27. Documentation and incident reporting
28. Training
29. Debriefing

Major Outcomes Considered

- Maternal and fetal survival rates
- Maternal and fetal morbidity

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

This guideline was developed in accordance with standard methodology for producing Royal College of Obstetricians and Gynaecologists (RCOG) Green-top guidelines (see "Availability of Companion Documents" field). The Cochrane Library (including the Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects [DARE] and EMBASE), Turning Research into Practice (TRIP), Medline and PubMed were searched for relevant randomised controlled trials, systematic reviews and meta-analyses. The search was restricted to articles published between 1960 and 2010. The databases were searched using the relevant MeSH terms, including all subheadings, and this was combined with a keyword search. Search words included 'amniotic fluid embolism', 'cardiac arrest and pregnancy', 'DVT and pregnancy', 'hypovolaemia and pregnancy', 'hypoxia and pregnancy', 'massive haemorrhage', 'maternal collapse' and 'resuscitation and pregnancy'. The search was also limited to humans and the English language. The National Library for Health and the National Guideline Clearinghouse were also searched for relevant guidelines and reviews.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Classification of Evidence Levels

1++ High-quality meta-analyses, systematic review of randomised controlled trials or randomised controlled trials with a very low risk of bias

1+ Well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias

1- Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias

2++ High-quality systematic reviews of case–control or cohort studies or high quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal

2+ Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal

2- Case–control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal

3 Non-analytical studies, e.g., case reports, case series

4 Expert opinion

Methods Used to Analyze the Evidence

Systematic Review

Description of the Methods Used to Analyze the Evidence

Reviewing and Grading of Evidence

Once the evidence has been collated for each clinical question it needs to be appraised and reviewed (refer to section 3 in "Development of RCOG Green-top guidelines: producing a clinical practice guideline" for information on the formulation of the clinical questions; see the "Availability of Companion Documents" field). For each question, the study type with least chance of bias should be used. If available, randomised controlled trials (RCTs) of suitable size and quality should be used in preference to observational data. This may vary depending on the outcome being examined.

The level of evidence and the grade of the recommendations used in this guideline originate from the guidance by the Scottish Intercollegiate Guidelines Network (SIGN) Grading Review Group, which incorporates formal assessment of the methodological quality, quantity, consistency, and applicability of the evidence base. The methods used to appraise individual study types are available from the SIGN Web site (www.sign.ac.uk/methodology/checklists.html). An objective appraisal of study quality is essential, but paired reviewing by guideline leads may be impractical because of resource constraints.

Once evidence has been collated and appraised, it can be graded. A judgement on the quality of the evidence will be necessary using the grading system (see the "Rating Scheme for the Strength of the Evidence" field). Where evidence is felt to warrant 'down-grading', for whatever reason, the rationale must be stated. Evidence judged to be of poor quality can be excluded. Any study with a high chance of bias (either 1– or 2–) will be excluded from the guideline and recommendations will not be based on this evidence. This prevents recommendations being based on poor-quality RCTs when higher-quality observational evidence is available.

Methods Used to Formulate the Recommendations

Expert Consensus

Informal Consensus

Description of Methods Used to Formulate the Recommendations

Guideline Development

The development of guidelines involves more than the collation and reviewing of evidence. Even with high-quality data from systematic reviews of randomised controlled trials, a value judgement is needed when comparing one therapy with another. This will therefore introduce the need for consensus.

Royal College of Obstetricians and Gynaecologists (RCOG) Green-top guidelines are drafted by nominated developers, in contrast to other guideline groups such as the National Institute for Health and Clinical Excellence (NICE) and the Scottish Intercollegiate Guidelines Network (SIGN), who use larger guideline development groups. Equally, in contrast to other guideline groups, the topics chosen for development as Green-top guidelines are concise enough to allow development by a smaller group of individuals.

In agreeing the precise wording of evidence-based guideline recommendations and in developing consensus-based 'good practice points', the Guidelines Committee (GC) will employ an informal consensus approach through group discussion. In line with current methodologies, the entire development process will follow strict guidance and be both transparent and robust. The RCOG acknowledges that formal consensus methods have been described but these require further evaluation in the context of clinical guideline development. It is envisaged that this will not detract from the rigor of the process but prevent undue delays in development.

Rating Scheme for the Strength of the Recommendations

Grades of Recommendation

A - At least one meta-analysis, systematic review or randomised controlled trial rated as 1++ and directly applicable to the target population; *or*

A systematic review of randomised controlled trials or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results

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Extrapolated evidence from studies rated as 1++ or 1+

C - A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results; *or*

Extrapolated evidence from studies rated as 2++

D - Evidence level 3 or 4; *or*

Extrapolated evidence from studies rated as 2+

Good Practice Point - Recommended best practice based on the clinical experience of the guideline development group

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Following discussion in the Guidelines Committee (GC), each Green-top guideline is formally peer reviewed. At the same time, the draft guideline

is published on the Royal College of Obstetricians and Gynaecologists (RCOG) Web site for further peer discussion before final publication.

All comments will be collated by the RCOG and tabulated for consideration by the guideline leads. Each comment will require discussion. Where comments are rejected then justification will need to be made. Following this review, the document will be updated and the GC will then review the revised draft and the table of comments.

Once the GC signs-off on the guideline, it is submitted to the Standards Board for approval before final publication.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Systematic consideration of the causes of collapse can enable skilled rescuers to identify the cause of collapse in the hospital setting and, where the cause is reversible, survival can be improved.
- Prevention of maternal mortality through maternal resuscitation

Potential Harms

Not stated

Qualifying Statements

Qualifying Statements

- These recommendations are not intended to dictate an exclusive course of management or treatment. They must be evaluated with reference to individual patient needs, resources and limitations unique to the institution and variations in local populations. It is hoped that this process of local ownership will help to incorporate these guidelines into routine practice. Attention is drawn to areas of clinical uncertainty where further research may be indicated.
- The Royal College of Obstetricians and Gynaecologists (RCOG) produces guidelines as an educational aid to good clinical practice. They present recognised methods and techniques of clinical practice, based on published evidence, for consideration by obstetricians and gynaecologists and other relevant health professionals. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made by the doctor or other attendant in the light of clinical data presented by the patient and the diagnostic and treatment options available.
- This means that RCOG guidelines are unlike protocols or guidelines issued by employers, as they are not intended to be prescriptive directions defining a single course of management. Departure from the local prescriptive protocols or guidelines should be fully documented in the patient's case notes at the time the relevant decision is taken.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Audit Criteria/Indicators

Clinical Algorithm

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Royal College of Obstetricians and Gynaecologists (RCOG). Maternal collapse in pregnancy and the puerperium. London (UK): Royal College of Obstetricians and Gynaecologists (RCOG); 2011 Jan. 24 p. (Green-top guideline; no. 56). [98 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2011 Jan

Guideline Developer(s)

Royal College of Obstetricians and Gynaecologists - Medical Specialty Society

Source(s) of Funding

Royal College of Obstetricians and Gynaecologists

Guideline Committee

Guidelines Committee

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Guidelines Committee lead peer reviewers: Mr M Griffiths, FRCOG, Luton and Mr SK Surendran, FRCOG, London

Financial Disclosures/Conflicts of Interest

None declared

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the Royal College of Obstetricians and Gynaecologists (RCOG) Web site .

Availability of Companion Documents

The following are available:

- Development of RCOG Green-top guidelines: policies and processes. Clinical Governance Advice No 1a. London (UK): Royal College of Obstetricians and Gynaecologists (RCOG); 2006 Nov. 6 p. Electronic copies: Available from the Royal College of Obstetricians and Gynaecologists (RCOG) Web site .
- Development of RCOG Green-top guidelines: producing a scope. Clinical Governance Advice No 1b. London (UK): Royal College of Obstetricians and Gynaecologists (RCOG); 2006 Nov. 4 p. Electronic copies: Available from the RCOG Web site .
- Development of RCOG Green-top guidelines: producing a clinical practice guideline. Clinical Governance Advice No 1c. London (UK): Royal College of Obstetricians and Gynaecologists (RCOG); 2006 Nov. 13 p. Electronic copies: Available from the RCOG Web site .
- Development of RCOG Green-top guidelines: consensus methods for adaptation of Green-top guidelines. Clinical Governance Advice No 1d. London (UK): Royal College of Obstetricians and Gynaecologists (RCOG); 2010 Feb. 9 p. Electronic copies: Available from the RCOG Web site .

In addition, auditable standards are available in section 6 of the original guideline document .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on June 10, 2011. The information was verified by the guideline developer on July 22, 2011.

Copyright Statement

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